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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/826,472	04/04/2001	Bin Yu	P1296	6214

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EXAMINER

POMPEY, RON EVERETT

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/826,472

Applicant(s)

YU, BIN

Examiner

Ron E Pompey

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3 and 5-20 is/are pending in the application.
- 4a) Of the above claim(s) 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3 and 5-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (US 5,963,810) and further in view of Dautartas et al. (US 6,124,158), Chen (US 5,994,192) and admitted prior art.

Gardner discloses the limitations of:

For 1, 2, 5-6, 8, 9, 11, 12 and 14:

depositing a first nitride film (303, fig. 3A) on a semiconductor substrate;

depositing a high-k material (305, fig. 3B) on the first nitride (col. 5, Ins. 30-64 and col. 3, Ins. 25-32),

depositing a second nitride film on the high-k material (col. 6, Ins. 13-20); and completing fabrication of the device (col. 6, Ins. 1-12).

3. Gardner does not disclose the claimed limitation(s) of, for claims 3, 7, 13 and 15-30:

wherein the nitride films are deposited by using an atomic layer deposition (ALD) technique.

However, Dautartas discloses the above claimed limitations in column 7, line(s) 15-30.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Dautartas with Gardner, because this deposition technique provides excellent uniformity and surface conformity of thin insulator films..

4. Gardner does not disclose the claimed limitation(s) of, for claims 10 and 18-19: that using a photoresist is part of the etching processes.

However, Chen discloses the above claimed limitations in column 4, line(s) 14-34.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Chen with Gardner, because Gardner is not explicit in how the gate is formed and applicant further support the *official notice* stated in the office action mailed 8-20-02.

Gardner does not disclose the claimed limitation(s) of, for claim 1 and 12:

Wherein the thin metal film comprises at least one material selected from the group consisting essentially of zirconium (Zr), hafnium (Hf) and titanium(Ti).

However, the admitted prior art discloses the above claimed limitations on page2, line(s) 1-8.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the admitted prior art with Gardner, because they are art recognized equivalent materials.

### ***Response to Arguments***

5. Applicant's arguments filed 3-5-03, pertaining to claims 1-3 and 5-19, have been fully considered but they are not persuasive.

6. The appellant argues that Gardner teaches deposition of the nitride layer and the high-k layer in a single chamber versus two separate processes atomic layer deposition (ALD) for nitride and sputtering for high-k layer and because Gardner teaches a 5 to 15 Å nitride layer and Dautartas teaches a layer at least 35 Å thick, that there is no motivation for combination of these references. However, none of the claim limitations disclose forming the nitride and high-k layers in a single chamber, therefore this argument are mute. Additionally one of ordinary skill in the art knows that ALD deposition of a high-k layer is well known in the art, therefore the nitride and high-k would be formed in the same chamber. Dautartas does teach forming nitride layers of tens or hundreds of atomic layers thick. However, that teaching (column 3, lines 49-50) further states "in order to form a gate dielectric film of the **desired thickness.**" In the case of Gardner, as cited by applicant (page 9, second full paragraph of appeal brief), the desired thickness is 5-15 Å, therefore one of ordinary skill in the art would combine Gardner and Dautartas to form a thin nitride of 5-15 Å layer by ALD.

7. The appellant argues that the equivalence argument is not based on prior art and therefore is erroneous. However, the basis for the equivalence rejection, which is taken from page 2 lines 1-8 of the applicant's specification, is taken from "The background of the invention" section of applicant's specification and therefore is considered prior art.

8. The appellant argues that Dautartas does not disclose forming 1-2 atomic layer thick first and second silicon nitride. However, Gardner teaches forming the first nitride layer at 5-15 Å and 1-2 atomic layers of nitride fall within that range, therefore, because Dautartas disclosing forming nitride layers one atomic layer at a time one of ordinary

skill in the art would combine Gardner and Dautartas for the reasons stated in the grounds of rejection section above.

For the above reasons, it is believed that the rejections should be traversed.

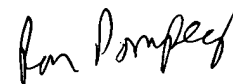
For the above reasons, it is believed that the rejections should be sustained.

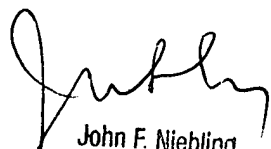
### **Conclusion**

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ron E Pompey whose telephone number is (703) 305-3016 and fax phone number is (703) 872-9306.

  
Ron Pompey  
Art Unit: 2812  
September 22, 2003

  
John F. Niebling  
Supervisory Patent Examiner  
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